What is claimed is:

1. A method for separating M signals provided by M sources and received by an array comprising N elements, said method comprising:

generating a hybrid separation matrix as a function of:

time differences between receipt of said M signals by said N elements;

a spatial fourth order cumulant matrix pencil;

a spatial correlation matrix; and,

steering vectors of said M signals,

and,

multiplying said hybrid separation matrix by a time series matrix representation of said M signals.

2. A method in accordance with Claim 1 wherein the hybrid separation matrix is in accordance with the following equation:

$\hat{w}_{j,hyb} = \left|\hat{v}_j^H \hat{K}_j^{-1} \hat{v}_j\right|^{-1} \hat{K}_j^{-1} \hat{v}_j$; wherein,

v_j is the steering vector of the j^{th} signal; and,

K_j is the noise spatial covariance matrix of the j^{th} signal.

3. A method in accordance with Claim 1 wherein said spatial fourth order cumulant matrix pencil is a function of a spatial fourth order cumulant matrix.

4. A method in accordance Claim 3, wherein said spatial fourth order cumulant matrix is in accordance with the following equation:

$$\mathbf{C}_{\mathbf{x}}^{4}(\tau_1,\tau_2,\tau_3) \equiv \sum_{i=1}^{N} Cum\left[x_i^*(t-\tau_1)x_i(t-\tau_2)\mathbf{x}(t)\mathbf{x}^{\mathbf{H}}(t-\tau_3)\right]$$, wherein:

$C_x^4(\tau_1,\tau_2,\tau_3)$ is said spatial fourth order cumulant matrix having a first time lag, τ_1, a second time lag, τ_2, and a third time lag, τ_3, each time lag being indicative of a time delay from one of said M sources to one of said N elements;

N is indicative of a number of elements in said array;

$Cum\ [x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)]$ is a cumulant operator on arguments $[x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)]$;

t is a variable representing time;

$x_i^*(t - \tau_1)$ represents a complex conjugate of one of said M signals from an i^{th} source at time $t - \tau_1$;

$x_i(t - \tau_2)$ represents one of said M signals from an i^{th} source at time $t - \tau_1$;

$\mathbf{x}(t)$ is a vector representation of said M signals; and

$\mathbf{x}^{\mathbf{H}}(t - \tau_3)$ represents the Hermitian transpose of $\mathbf{x}(t - \tau_3)$.

5. A method in accordance with Claim 1 wherein said step of generating said hybrid separation matrix comprises performing a generalized eigenvalue analysis of said spatial fourth order cumulant matrix pencil.

6. A method in accordance with Claim 1 wherein M = N.

7. A method in accordance with Claim 1 wherein M < N.

8. A computer readable medium encoded with a computer program code for directing a processor to separate M signals provided by a Msources and received by an array comprising N elements, said program code comprising:

a first code segment for causing said processor to generate a hybrid separation matrix as a function of:

time differences between receipt of said M signals by said N elements;

a spatial fourth order cumulant matrix pencil;

a spatial correlation matrix; and,

steering vectors of said plurality of signals,

and,

a second code segment for causing said processor to multiply said separation matrix by a time series matrix representation of said M signals.

9. A computer readable in accordance with Claim 8 wherein the hybrid separation matrix is in accordance with the following equation:

$\hat{w}_{j,hyb} = \left|\hat{v}_j^H \hat{K}_j^{-1} \hat{v}_j\right|^{-1} \hat{K}_j^{-1} \hat{v}_j$; wherein,

v_j is the steering vector of the j^{th} signal;

K_j is the noise spatial covariance matrix of the j^{th} signal.

10. A computer readable in accordance with Claim 8 wherein

said spatial fourth order cumulant matrix pencil is a function of a spatial fourth order cumulant matrix being a summation of steering vector outer products scaled by an individual source signal's fourth order cumulant; and,

said steering vector is indicative of respective phase delays between ones of said N elements.

11. A computer readable medium in accordance Claim 10 wherein said spatial fourth order cumulant matrix is in accordance with the following equation:

$$\mathbf{C}_{\mathbf{x}}^{4}\left(\tau_1,\tau_2,\tau_3\right) \equiv \sum_{i=1}^{N} Cum\left[x_i^*\left(t-\tau_1\right)x_i\left(t-\tau_2\right)\mathbf{x}(t)\mathbf{x}^{\mathbf{H}}\left(t-\tau_3\right)\right]$$, wherein:

$C_x^4(\tau_1,\tau_2,\tau_3)$ is said spatial fourth order cumulant matrix having a first time lag, τ_1, a second time lag, τ_2, and a third time lag, τ_3, each time lag being indicative of a time delay from one of said M sources to one of said N elements;

N is indicative of a number of elements in said array;

$Cum\ [x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)]$ is a cumulant operator on arguments $x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)$;

t is a variable representing time;

$x_i^*(t - \tau_1)$ represents a complex conjugate of one of said M signals from an i^{th} source at time $t - \tau_1$;

$x_i(t - \tau_2)$ represents one of said M signals from an i^{th} source at time $t - \tau_1$;

$\mathbf{x}(t)$ is a vector representation of said M signals; and

$\mathbf{x}^{\mathbf{H}}(t - \tau_3)$ represents the Hermitian transpose of $\mathbf{x}(t - \tau_3)$.

12. A computer readable medium in accordance with Claim 8, said program code further comprising:

a third code segment for causing said processor to perform a generalized eigenvalue analysis of said spatial fourth order cumulant matrix pencil.

13. A computer readable medium in accordance with Claim 8 wherein M = N.

14. A computer readable medium in accordance with Claim 8 wherein M < N.

15. A system for separating M signals provided by M sources, said system comprising:

a receiver for receiving said M signals and for providing received signals therefrom; and

a signal processor for receiving said received signals, generating a hybrid separation matrix, and multiplying said separation matrix by a time series matrix representation of said received signals, wherein:

said hybrid separation matrix is a function of time differences between receipt of said M signals by said receiver, a spatial correlation matrix; steering vectors of said M signals and a spatial fourth order cumulant matrix pencil.

16. A system in accordance with Claim 15, wherein the hybrid separation matrix is in accordance with the following equation:

$\hat{w}_{j,hyb} = \left|\hat{v}_j^H \hat{K}_j^{-1} \hat{v}_j\right|^{-1} \hat{K}_j^{-1} \hat{v}_j$; wherein,

v_j is the steering vector of the j^{th} signal;

K_j is the noise spatial covariance matrix of the j^{th} signal.

17. A system in accordance with Claim 15 wherein said receiver comprises N elements configured to form an array.

18. A system in accordance with Claim 15 wherein

said spatial fourth order cumulant matrix pencil is a function of a spatial fourth order cumulant matrix being a summation of steering vector outer products scaled by an individual source signal's fourth order cumulant; and,

said steering vector is indicative of respective phase delays between ones of said N elements.

19. A system in accordance Claim 18 wherein said spatial fourth order cumulant matrix is in accordance with the following equation:

$$\mathbf{C}_{\mathbf{x}}^{4}(\tau_1,\tau_2,\tau_3) \equiv \sum_{i=1}^{N} Cum\left[x_i^*(t-\tau_1)x_i(t-\tau_2)\mathbf{x}(t)\mathbf{x}^{\mathbf{H}}(t-\tau_3)\right]$$, wherein:

$C_x^4(\tau_1,\tau_2,\tau_3)$ is said spatial fourth order cumulant matrix having a first time lag, τ_1, a second time lag, τ_2, and a third time lag, τ_3, each time lag being indicative of a time delay from one of said M sources to one of said N elements;

N is indicative of a number of a number of elements in said array;

$Cum\ [x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)]$ is a cumulant operator on arguments $x_i^*(t - \tau_1)\ x_i(t - \tau_2)\ \mathbf{x}(t)\ \mathbf{x}^{\mathbf{H}}(t - \tau_3)$;

t is a variable representing time;

$x_i^*(t - \tau_1)$ represents a complex conjugate of one of said M signals from an i^{th} source at time $t - \tau_1$;

$x_i(t - \tau_2)$ represents one of said M signals from an i^{th} source at time $t - \tau_1$;

$\mathbf{x}(t)$ is a vector representation of said M signals; and

$\mathbf{x}^{\mathbf{H}}(t - \tau_3)$ represents the Hermitian transpose of $\mathbf{x}(t - \tau_3)$.

20. A system in accordance with Claim 17 wherein M = N.

21. A system in accordance with Claim 17 wherein M < N.

22. In a method for recovering low SNR signals in an multi-signal and noise environment with a multi-sensor array wherein a separation matrix is applied to the multi-sensor array data, the improvement of forming the separation matrix with hybrid minimum mean squared error weights, wherein said weights are generated as a function of a spatial correlation matrix; steering vectors of said multiple signals and a spatial fourth order cumulant matrix pencil.

23. A method in accordance with Claim 22 wherein the number of said multiple signals is equal to the number of said multiple sensors in said array.

24. A method in accordance with Claim 22 wherein the number of said multiple signals is less than the number of said multiple sensors in said array.

25. A method for recovering an unknown signal from a composite signal containing the unknown signal and at least one interferer signal and noise, said method comprising the step of generating a separation matrix to suppress the at least one interferer signal and the noise, wherein the separation matrix is a function of the spatial correlation matrix of the unknown signal, a steering vector, and a spatial fourth order cumulant matrix pencil of the unknown signal and the at least one interferer signal.

26. A method in accordance with Claim 25 wherein said composite signal comprises M signals and is received on an N element array.

27. A method in accordance with Claim 26 wherein $M = N$.

28. A method in accordance with Claim 26 wherein $M < N$.